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***investigation***  
**SMALL SEED LOT  
PROCESSING  
EQUIPMENT**

ED&T 2340  
GROWING SEEDLINGS IN A  
CONTROLLED ENVIRONMENT

AUGUST 1974



**U.S. Department of Agriculture  
Forest Service  
Equipment Development Center  
Missoula, Montana**

NO. 7524 2207



**United States  
Department of  
Agriculture**



**National Agricultural Library**

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PRELIMINARY REPORT:

INVESTIGATION OF SMALL SEED LOT PROCESSING EQUIPMENT

ED&T 2340

GROWING SEEDLINGS IN A CONTROLLED ENVIRONMENT

By

BEN J. LOWMAN

MECHANICAL ENGINEER

August 1974

USDA Forest Service  
Equipment Development Center  
Missoula, Montana





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## INTRODUCTION

As a result of rapidly expanding tree improvement programs, tree nurseries are being called upon to process a greater number of small seed lots. Most nurseries have equipment capable of processing the large seed lots but have found small lots difficult to process with large equipment. One problem is the difficulty in cleaning large equipment between seed lots. Complete cleaning must be done to insure that each lot is properly identified and seeds from different lots are not mixed. Complete cleaning increases in importance as the lots decrease in size to insure quality control. As a result, interest has grown in equipment to process small seed lots.

Under ED&T 2340, the Missoula Equipment Development Center (MEDC) is conducting an investigation to determine what equipment is commercially available for processing small seed lots, what is presently being used, and what areas need development. This project record covers a survey of Federal tree nurseries, limited field investigations, literature search, conclusions, and recommendations. Further recommendations will be made when the investigation is completed.

## SURVEY OF FEDERAL NURSERIES

MEDC surveyed Federal tree nurseries to learn what equipment is being used to process small seed lots, the average size of small seed lots, average number of small seed lots processed each year, species processed, and other pertinent information (see appendix 1). Survey results are listed in table 1.

In discussing seed lot sizes (in terms of bushels of cones), these variables must be considered: tree species, cone size, seed yield per bushel, seed weight. Table 2 lists some common tree species and shows the variations among them. Tree seed processing equipment, then, must be flexible and capable of handling a whole range of seeds.

From the survey the following conclusions were made:

1. Over half the Federal nurserymen questioned stated that they would benefit from a project to develop equipment to process small seed lots. Several nurserymen have equipment suitable for a few, but not all, of the steps that must be performed in processing small seed lots. Small seed lot processing equipment for this investigation was defined as that capable of efficiently processing from one cone up to 10 bushels of cones, or the seed from these cones.

2. Small seed lot size varies widely among nurseries--from 100 bushels of cones to a few cones. Most nurserymen consider a small seed lot to be about 10 bushels of cones or less.

3. Equipment presently used to process small seed lots includes:

Kilns - large commercial kilns or small homemade kilns (used to dry cones).

Tumblers - large commercial tumblers with cones in burlap sacks or small homemade tumblers usually turned by hand (used to extract seeds from cones). (Kiln and tumbler are usually combined into one operation on large seed lots).

Clippers - M-2B and an office model by Ferrell-Ross (separates much of the trash from the seed).

Dewingers - homemade or dewinging by hand. (Removes wings that are attached to the seed.)

Pneumatic Separators - Dakota Blowers are commonly used (separates good seed from light hollow seed and trash. Final cleaning, step 1).

Gravity Separators - often use commercially available laboratory models. (Separates hollow or partially filled seed or foreign material the same size as the seed from the good seed. Final cleaning, step 2.)





Table 1.--Results of survey

Nursery	Size of small seed lot	What should be the maximum capacity of processing equipment?	No. of small lots processed per year	Equipment you have	Species processed	Equipment needed to process small lots	Commercially available equipment you know of	Would you benefit from project?
Coeur d'Alene	10 bu or less	2 to 3	50	Small drying tray. Homemade tumbler. Dakota Blower.	DF, GF, ES, WH, LPP, PP, WWP, AF	Family of equipment (lab size).	None	Yes
Mt. Sopris	10 bu or less	10 bu	25	Lab model clipper. Homemade dewinger (2 kinds).	ES, LPP, OF, TRUE FIRS	Better model clipper type separator and dewinger.	Lab model clipper & home-made equipment.	Yes
Humboldt No seed handling equipment. All seed processed at Placerville.								
Bend Pine	3 bu or less	5 bu	Trying to obtain equipment to process only small lots.	None that is acceptable.	PP and LPP	Small revolving kiln; possibly electric heat - small dewinger and air separator.	None	Yes
Lucky Peak	10 bu or less	5 bu	10 in normal year. 350-400 of tree improvement cones in cone production years.	Air dry w/trays used for large lots. Homemade tumbler. Hand dewinging in cloth bags. Desk model clipper cleaner. Air cleaner (cylinder). Mechanized tumbler-dewinger.	PP, LPP, OF and ES		None	Yes, but strongly against project when need a precision seeding machine.
Wind River	10 bu or less	10-20 bu/hr	50-100	Almost none.	OF, SUGAR PINE, WP, ES, HEM, WRC, WL, LPP, NOBLE FIR, WHITE FIR	M-2B cleaner-shaker is satisfactory for cleaning small lots. Each nursery could design and build own shaker.	A-11 Ferrell	??
W. W. Ash	100 bu or less	50 bu		None	LONGLEAF, SHORT-LEAF, SLASH, LOBLOLLY and SAND PINE	Small kiln (50 bu cap) Tumbler (2 bu) Small scalper, small dewinger, small cleaner.	Clipper cleaner that can serve as scalper.	Yes
Bessey Not processing small seed lots. Small lot S# due to drill.								No
Placerville	As small as 1 bu of cones.	Most important is the smallest lot one can easily clean out machine.	Over 1400	Ferrell-Ross Office Clipper. M-2B clipper. Super 47B EP-26B Air Separator. David Bradley seed cleaner.	RED FIR, WHITE FIR, PP, JP, DF	Simpler seed counting system.	Seedburo equipment listed in catalog.	No; based on experience, development is so specialized it is only workable on a few sites. Possibly some help could be gained by some of your engineers visiting and reviewing problems on site.
Eveleth	3-5 bu 6 oz to 3 lbs of seed.	2-5 bu	1	Ferrell-Ross Office Clipper.	RED PINE, WHITE SPRUCE, BLACK SPRUCE, JACK PINE, BIRCH	Dewinger.	None	Yes





Table 2.--Seed yield per bushel of cones

<u>Species</u>	<u>Oz/bu of cones (average)</u>	<u>No. seed/oz (average)</u>	<u>No. seed/bu of cones (average)</u>
Lodgepole pine	4.0	8,450	33,800
Engelmann spruce	5.6	8,500	47,600
Western white pine	8.0	1,690	13,520
Western larch	8.0	8,900	71,200
Douglas-fir	9.6	2,610	25,056
Ponderosa pine	16.0	750	12,000
Hemlock	16.0	13,700	219,200
Western red cedar	24.0	25,800	619,200
Alpine fir	32.0	2,340	74,880
Grand fir	32.0	1,450	46,400

During the survey, several nurserymen stated they would like a list of seed processing equipment manufacturers. This would be helpful for contacting seed equipment companies to obtain specific information on commercially available equipment. The list should include both large and small equipment and be divided into various seed processing categories such as pneumatic seed cleaners, gravity separators, etc. To give further assistance to nurserymen, a catalog could be assembled showing equipment commercially available that has been used successfully for processing small seed lots.

#### FIELD INVESTIGATION

To gain a background in the problems involved in processing tree seed, Center personnel visited the Oregon State Seed Laboratory at Oregon State University (OSU), Corvallis, Oregon; the USDA Agriculture Research Service at OSU; the Forestry Sciences Lab at OSU; Weyerhaeuser Company seed processing plant at Rochester, Washington; Sylva Seed Company at Roy, Washington; and Coeur d'Alene Nursery in Idaho.



## Oregon State Seed Laboratory

The Oregon State Seed Laboratory demonstrated various methods they use to test purity, germination, etc. The laboratory's Oregon Continuous Seed Separator--a pneumatic separator--has been used successfully in lab processing of some agricultural crop seeds, and may be of use on small lots of tree seeds (fig. 1).



Figure 1.--Oregon continuous seed separator.

## Agriculture Research Service

The Agriculture Research Service at OSU has evaluated and developed equipment for processing agricultural crop seed since the early 1950's. During our visit, lab equipment was used to show current methods of separating and cleaning agricultural crop seeds. Some of these methods have been applied to processing tree seed.

Generally, tree seed is more easily damaged than agricultural crop seeds, and some methods successfully used on

crop seeds cannot be used for tree seed. Equipment observed for processing seeds included:

- Color Separators
- \*Screen Separators
- Pneumatic Separators
- Magnetic Separators
- \*Indent Cylinder Separators
- Specific Gravity Separators
- Velvet Roll Separators
- Spiral Separators
- Inclined Draper Separators
- Horizontal Disc Separators
- \*Vibratory Separators
- Electrostatic Separators
- Resilience Separators
- Diverging Roll Separators
- Bumper Mills
- Buckhorn Machines
- Polishers
- Debearders

\*See figures 2, 3, and 4--Courtesy Agriculture Handbook 354, U. S. Department of Agriculture.

Literature on the seed processing equipment and a list of manufacturers were obtained during the visit (see appendix 2).

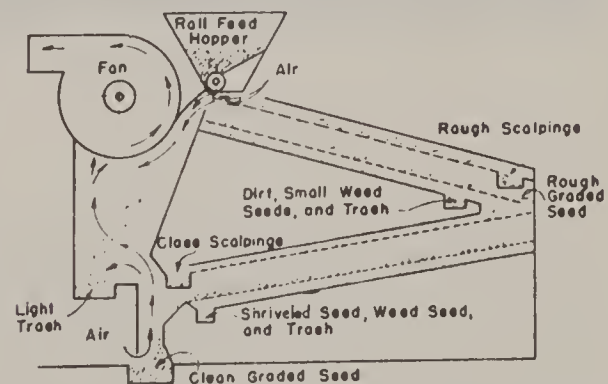


Figure 2.--Air-screen cleaner (separator).

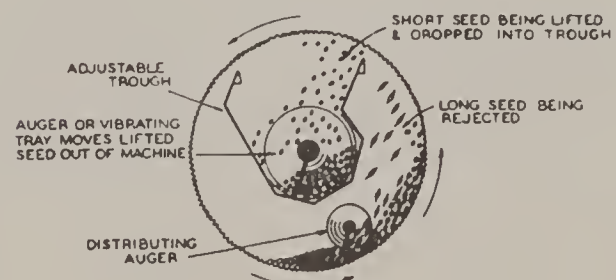


Figure 3.--Indent cylinder separator.







*Figure 4.--Vibrator separator.*

#### Forestry Sciences Lab

A pneumatic laboratory seed cleaner and separator was examined at the Forestry Sciences Lab. This unit combines the Dakota Blower and the Silen seed separator (fig. 5). This cleaner processes only small amounts of seed at a time and was designed for laboratory work only.

#### Eastern Tree Seed Lab Equipment

During the visit at OSU, MEDC personnel were accompanied by Jim McConnell, Director of Eastern Tree Seed Lab, Macon,

Georgia. The Center's investigation of small seed lot processing equipment was discussed, and McConnell talked about equipment used at the Eastern Tree Seed Lab, including a small kiln which has proven satisfactory for small seed lots. Jerry Edwards (ED&T Southern Region (R-8)) will make construction drawings of the kiln. MEDC will obtain these drawings when they become available. Equipment for processing small seed lots at the Eastern Tree Seed Lab includes a small aspirator, a small office-type seed cleaner, a small specific gravity separator, and the kiln (figs. 6, 7, 8, and 9).





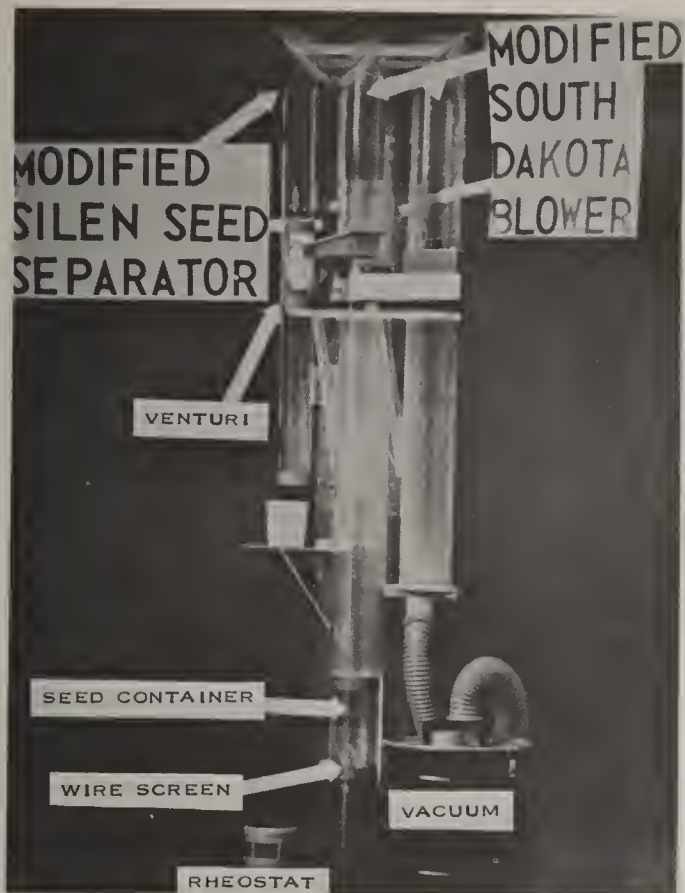


Figure 5.--Lab seed cleaner. <sup>1/</sup>



Figure 6.--Aspirator.



Figure 7.--Cleaner (office type clipper).



Figure 8.--Specific gravity table.

<sup>1/</sup> Tree Planters Notes, Vol. 24, No. 4, p. 16. Nov. 1973.





Figure 9.--Small kiln.

#### Weyerhaeuser Seed Processing Plant

Weyerhaeuser's seed processing plant at Rochester, Washington, has equipment to process very large seed lots. To complement this large equipment, they have a small test laboratory equipped with a gravity separator, Dakota-type pneumatic blower, and a hand tumbler, along with seed testing equipment. Weyerhaeuser has designed and built a prototype medium-sized tree seed cleaner to handle both large and small seed lots. This machine applies the principles of pneumatic, screen, and gravity separation to clean the seed. The machine is designed to provide one-step seed cleaning operation after the seed has been extracted from the cone. This machine would cost \$8,000-\$10,000 to build. MEDC will be obtaining more information on this machine.

#### Sylva Seed Company

The Sylva Seed Company uses similar processing equipment and methods with one notable exception: some species of tree seed are dewinged by tumbling in a cylinder. The rubbing action between seeds and the mild abrasive action of the cylinder dewings the seed.

#### Webster State Nursery

MEDC personnel visited briefly the Webster State Nursery in Washington. The one unique piece of equipment here was a small homemade drying kiln for small seed lots.

#### Coeur d'Alene Nursery

To gain further insight into processing tree seed, the Coeur d'Alene Nursery was visited. Here cones are preheated and put in a rotary kiln where seeds are extracted from the cones. The seed is then scalped using screens. Certain species of seeds are dewinged with a Crippen EP-26 Dewinger or, on small lots, a homemade dewinger. This homemade dewinger consists of a rubber-lined cylinder with numerous rubber fingers attached to a shaft through the center. The shaft with rubber (chicken plucking) fingers is rotated at a desired speed to dewing the seed. This homemade dewinger has an air volume control for removing wings and fine material. Final cleaning is done with a Rainbow air separator and a gravity separator. These cleaning steps will vary depending upon the species of the tree seed to be processed.

#### LITERATURE AND MARKET SEARCH

A Current Research Information System (CRIS) literature search was made as well as a search of industry periodicals and other sources to determine the state of the art. The Agriculture Research Service at OSU supplied a list of seed processing equipment manufacturers. A letter was sent to manufacturers on the list requesting information on their equipment (see appendix 3). Catalogs and brochures are being obtained from these companies and to date more than 40 have responded.

Most commercial equipment has been designed primarily to process agricultural seed such as oats, wheat, clover, etc., but several types have application in processing tree seed once the seed has been extracted from the cones.

Dr. Bonner at Mississippi State University was contacted because of his experience in working with eastern forest tree seeds. Also, the Agronomy Department at Mississippi State has done extensive work on crop seed processing equipment and a 300-page pamphlet covering equipment for processing agricultural crop seed was obtained.





## RESULTS

The survey of Federal nurseries indicated that none of the nurserymen are aware of a complete family of equipment to process small seed lots. Some nurserymen have improvised with homemade equipment as well as with some commercially available equipment. Generally, they are not satisfied with the complete processing system but are satisfied with specific equipment such as the gravity separator. Some nurserymen are unaware of any commercially available equipment to process small seed lots. Several nurserymen stated they would benefit from a list of manufacturers of seed processing equipment.

Information gathered from various sources, including equipment manufacturers, indicates some commercially available equipment that might be applicable to processing small lots of tree seed. Some of this equipment, such as the M-2B clipper and the gravity separator, are being used successfully at one or more of the nurseries. Other equipment, such as indent separators, varieties of pneumatic separators, electrostatic separators, rotary screen separators, and vibratory separators, are not being used. Only a

complete testing program would show the benefits and shortcomings of this equipment. During the preliminary investigation no commercially available small dewingers or kilns were found. However, several custom built kilns and dewingers are currently being used. Any testing of equipment used to process tree seed should include tests for seed damage because some tree seeds are very easily damaged.

## CONCLUSIONS

1. Keeping abreast of commercial sources of seed processing equipment is difficult for most nurserymen.
2. Equipment suitable for performing some steps in processing small seed lots is available. However, a complete family of compatible equipment is needed for efficient small seed lot processing.
3. There is a need to evaluate seed processing equipment to determine which machines are best suited for processing small seed lots. Any evaluation should include testing for seed damage.



## RECOMMENDATIONS

Complete investigation of small seed lot processing equipment and make recommendations after investigation has been completed.

Meet with sponsor to present findings of the preliminary investigation and discuss further direction of project.





## UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE  
Equipment Development Center  
Fort Missoula  
Missoula, Montana 59801

REPLY TO: 7120 Equipment Development and Test

April 23, 1974

SUBJECT: Equipment for Processing Small Seed Lots

TO: All Forest Service Nurserymen



The Washington Office, Division of Timber Management, has asked the Center to look into the problem of processing small seed lots. If your reply, together with others, indicates that there is a need for an equipment development effort, we believe that one can be undertaken in FY 75.

We know that you are especially busy this time of year, so we will attempt to simplify our inquiry by asking you just a few questions. Please note your replies in pen or pencil on this memo and return them to this office in the enclosed self-addressed envelope. Any additional comments, of course, would be welcomed.

1. We need a better definition of what a small seed lot means to a Forest Tree Nurseryman. In your operation, what is the average size of a small seed lot (in bushels)?

---

2. What should be the maximum capacity of equipment designed for treating small seed lots (in bushels)?

---

3. Approximately how many small lots of seed do you process a year?

---

What are the major species? 

---

---

4. Are you satisfied with your equipment for processing small seed lots at your nursery?

---



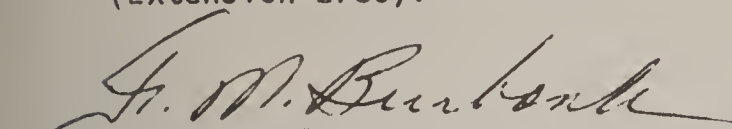
5. Please state what kind of equipment you have for treating small seed lots. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
6. Please state what kind of equipment you would like to see developed for treating small seed lots. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
7. Are you aware of any commercial or custom built equipment that is suitable for this use? Please state the kind of equipment and where it can be found. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
8. Will your nursery operation benefit from a development effort in this area? \_\_\_\_\_  
\_\_\_\_\_
9. Comments. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





At the present time we have received back about 55% of the 135 questionnaires entitled "Survey - Nursery Practices and Equipment Needs," sent out. When all the results are tabulated, we will send you a copy of the report.

If you have any questions regarding this memo, please contact Dick Hallman at the Center. His phone number is (406) 549-6511, (Extension 2783).



F. M. BURBANK  
Director

Enclosure



## A PARTIAL LIST OF SEED PROCESSING MACHINERY MANUFACTURERS

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1/ Reference to a company or product is for information only and does not imply an endorsement by the U.S. Department of Agriculture or a recommendation over other companies or products.





AIR-SCREEN AND SCREEN MACHINES

Burrows Equipment Company  
1316 North Sherman Avenue  
Evanston, Illinois 60201

Carter-Day Company  
655 19th Avenue, N.E.  
Minneapolis, Minnesota 55418

Cleland International, Inc.  
P.O. Box 8  
Rogers, Minnesota 55374

Corn States Metal Fabricators, Inc.  
1323 Maple Street  
Des Moines, Iowa 50265

Crippen Manufacturing Company  
704 Virginia Street  
Alma, Michigan 48801

Duplex Mill & Manufacturing Company  
400 Sigler Street  
Springfield, Ohio 45501

Equipment Specialists, Inc.  
Route 48, West  
Taylorville, Illinois 62568

Ferrell-Ross Company  
6501 South Interpace Drive  
P.O. Box 26468  
Oklahoma City, Oklahoma 73126

Forsbergs, Inc.  
Corner Conley & Hughes Streets  
Thief River Falls, Minnesota 56701

Hance Corporation  
235 East Broadway  
Westerville, Ohio 43081

Howes, S., Company, Inc.  
1974 Miller Street  
Silver Creek, New York 14136

Huntley Manufacturing Company  
Buckholtz Road  
Brocton, New York 14716

Ideal Grain and Cleaning Company  
473 North Cleveland Avenue  
St. Paul, Minnesota 55104

Mater Machine Works  
520 South First Street  
P.O. Box 410  
Corvallis, Oregon 97330

Oliver Manufacturing Company, Inc.  
P.O. Box 512  
Rocky Ford, Colorado 81067

Rice, W.A., Seed Company  
Jerseyville  
Illinois 62050

Seedburo Equipment Company  
618-628 West Jackson Blvd.  
Chicago, Illinois 60606

Snow Corporation  
4350 McKinley Street  
Omaha, Nebraska 68112

Triple/s Dynamics Sutton/Overstrom, Inc.  
1029 South Haskell  
Dallas, Texas 75223

AIR SEPARATORS (See Pneumatic Separators)



ASPIRATORS (See Pneumatic Separators)BEAN EQUIPMENT (SPECIAL)

American International Mfg. Co.  
P.O. Box 729  
Woodland, California 95695

Crippen Manufacturing Company  
704 Virginia Street  
Alma, Michigan 48801

Ferrell-Ross Company  
6501 South Interpace Drive  
P.O. Box 26468  
Oklahoma City, Oklahoma 73126

Forsbergs, Inc.  
Corner Conley & Hughes Streets  
Thief River Falls, Minnesota 56701

Grisez, John F., Company  
P.O. Box 25  
Crows Landing, California 95313

Howes, S., Company, Inc.  
1974 Miller Street  
Silver Creek, New York 14136

Huntley Manufacturing Company  
Buckholtz Road  
Brocton, New York 14716

Rice, W.A., Seed Company  
Jerseyville  
Illinois 62050

BUCKHORN SEPARATORS

Ferrell-Ross Company  
6501 South Interpace Drive  
P.O. Box 26468  
Oklahoma City, Oklahoma 73126

McLaughlin, Ward and Company  
409 South 23rd Street  
Jackson, Michigan 49203

Rice, W.A., Seed Company  
Jerseyville  
Illinois 62050

Triple/s Dynamics Sutton/Overstrom, Inc.  
1029 South Haskell  
Dallas, Texas 75223

BUMPER MILLS

Hance Corporation  
235 East Broadway  
Westerville, Ohio 43081

COLOR SORTERS

FMC Corporation  
Food Machinery International Div.  
1405 Coleman Avenue  
San Jose, California 95108

Sortex Company of North America, Inc.  
P.O. Box 160  
Lowell, Michigan 49331

Mandrel Products  
6909 Southwest Freeway  
P.O. Box 36306  
Houston, Texas 77036



CONVEYORS AND ELEVATORS*(Pneumatic, Belt, Auger, Chain, Vibratory)*

Allied Products Corporation  
Continental/Moss-Gordon Gin Company  
Prattville, Alabama 36067

Aseeco Corporation  
1830 West Olympic Blvd.  
Los Angeles, California 90006

Burrows Equipment Company  
1316 North Sherman Avenue  
Evanston, Illinois 60201

Carter-Day Company  
655 19th Avenue, N.E.  
Minneapolis, Minnesota 55418

Clermont Machine Company, Inc.  
282 Wallabout Street  
Brooklyn, New York 11206

Corn States Metal Fabricators, Inc.  
1323 Maple Street  
West Des Moines, Iowa 50265

D & G Associates  
6215 West Touhy Avenue  
Chicago, Illinois 60648

Doboy Packaging Machinery  
871 South Knowles Avenue  
New Richmond, Wisconsin 54017

Duplex Mill & Manufacturing Company  
400 Sigler Street  
Springfield, Ohio 45501

Equipment Specialists, Inc.  
Route 48, West  
Taylorville, Illinois 62568

Ferrell-Ross Company  
6501 South Interpace Drive  
P.O. Box 26468  
Oklahoma City, Oklahoma 73126

Food Machinery Corporation  
Link-Belt Material Handling Systems Div.  
Department 385  
Colmar, Pennsylvania 18915

Forsbergs, Inc.  
Corner Conley & Hughes Streets  
Thief River Falls, Minnesota 56701

Gompper-Maschinen-Gesellschaft  
Buederich/Duesseldorf, Germany  
U.S. Representative: Ulbeco, Inc.  
P.O. Box 146  
Bergenfield, New Jersey 07621

Huss and Schlieper  
2230 North Brush College Road  
Decatur, Illinois 62525

McLaughlin, Ward and Company  
409 South 23rd Street  
Jackson, Michigan 49203

Meyer Machine Company  
3530 Fredericksburg Road  
San Antonio, Texas 78201

Myers-Sherman Company  
1617 South Illinois Street  
Streator, Illinois 61364

Oliver Manufacturing Company, Inc.  
P.O. Box 512  
Rocky Ford, Colorado 81067

Pack-Rite Machines  
3817 Nicholson Road  
Franksville, Wisconsin 53126

Prater Industries, Inc.  
1517-41 South 55th Court  
Chicago, Illinois 60650





CONVEYORS AND ELEVATORS (Continued)

Red Oak Manufacturing Company  
P.O. Box 117  
Red Oak, Iowa 51566

Reid-Strutt Company, Inc.  
929 N.E. 23rd Avenue  
Portland, Oregon 97405

Rexnord Inc.  
Chain and Conveyor Division  
P.O. Box 2022  
Milwaukee, Wisconsin 53201

Seedburo Equipment Company  
618-628 West Jackson Blvd.  
Chicago, Illinois 60606

Speed King Manufacturing Company, Inc.  
P.O. Box 1438  
Dodge City, Kansas 67801

Sprout-Waldron & Company, Inc.  
802 Logan Street  
Muncy, Pennsylvania 17756

Stephens-Adamson Company  
275 Ridgeway Avenue  
Aurora, Illinois 60507

Stone Conveyor Inc.  
34 East Main Street  
Honeoye, New York 14471

Universal Inc.  
P.O. Box 596  
Cedar Falls, Iowa 50613

York Foundry and Engine Works, Inc.  
912-928 Grant Avenue  
York, Nebraska 68467

DEBEARDERS

Crippen Manufacturing Company  
704 Virginia Street  
Alma, Michigan 48801

Ferrell-Ross Company  
6501 South Interpace Drive  
P.O. Box 26468  
Oklahoma City, Oklahoma 73126

Gompper-Maschinen-Gesellschaft  
Buederich/Duesseldorf, Germany  
U.S. Representative: Ulbeco, Inc.  
P.O. Box 146  
Bergenfield, New Jersey 07621

Howes, S., Company, Inc.  
1974 Miller Street  
Silver Creek, New York 14136

Mater Machine Works (Lab Size)  
520 South First Street  
P.O. Box 410  
Corvallis, Oregon 97330

DEHUMIDIFIERS

Airflow Company  
Dryomatic Division  
Airport Industrial Center  
Gaithersburg, Maryland 20760

American Instruments  
Hygrodynamic Facility  
8030 Georgia Avenue  
Silver Spring, Maryland 20910

Seedburo Equipment Company  
618-628 West Jackson Blvd.  
Chicago, Illinois 60606

Universal Dynamics Corporation  
13614 Dawson Beach Drive  
Woodbridge, Virginia 22191



DODDER ROLLS (See Velvet-Roll Separators)DRIERS

Aeroglide Corporation  
7100 Hillsborough Road  
Raleigh, North Carolina 27602

Equipment Specialists, Inc.  
Route 48, West  
Taylorville, Illinois 62568

Aerovent Fan and Equipment, Inc.  
Agricultural Division  
931 Terminal Road  
Lansing, Michigan 48906

Ferrell-Ross Company  
6501 South Interpace Drive  
P.O. Box 26468  
Oklahoma City, Oklahoma 73126

Corn States Metal Fabricators, Inc.  
1323 Maple  
West Des Moines, Iowa 50265

DUST COLLECTORS

Carter-Day Company  
655 19th Avenue, N.E.  
Minneapolis, Minnesota 55418

Forsbergs, Inc.  
Corner Conley and Hughes Streets  
Thief River Falls, Minnesota 56701

Corn States Metal Fabricators, Inc.  
1323 Maple Street  
West Des Moines, Iowa 50265

Howes, S., Company, Inc.  
1974 Miller Street  
Silver Creek, New York 14136

Duplex Mill & Manufacturing Co.  
400 Sigler Street  
Springfield, Ohio 45501

Sprout-Waldron & Company, Inc.  
802 Logan Street  
Muncy, Pennsylvania 17756

Ferrell-Ross Company  
6501 South Interpace Drive  
P.O. Box 26468  
Oklahoma City, Oklahoma 73126

Triple/s Dynamics Sutton/Overstrom, Inc.  
1029 South Haskell  
Dallas, Texas 75223

ELECTROSTATIC SEPARATORS

Carpco Research and Engineering, Inc.  
4120 Haines Street  
Jacksonville, Florida 32206

Separations Engineering Corp.  
110 East 42nd Street  
New York, New York 10036

Dings Company  
4740 West Electric Avenue  
Milwaukee, Wisconsin 53246





ELEVATORS (See Conveyors)FANNING MILLS (See Air-Screen and Screen Machines)GRADERS (See Air-Screen and Screen Machines)GRAVITY SEPARATORS

Bauer Bros Company  
1717 Sheridan Avenue  
Springfield, Ohio 45505

Equipment Specialists, Inc.  
Route 48, West  
Taylorville, Illinois 62568

Forsbergs, Inc.  
Corner Conley & Hughes Streets  
Thief River Falls, Minnesota 56701

Hance Corporation  
235 East Broadway  
Westerville, Ohio 43081

Oliver Manufacturing Company, Inc.  
P.O. Box 512  
Rocky Ford, Colorado 81067

Seedburo Equipment Company  
618-628 West Jackson Blvd.  
Chicago, Illinois 60606

Triple/s Dynamics Sutton/Overstrom, Inc.  
1029 South Haskell  
Dallas, Texas 75223

HULLERS (See Scarifiers)INCLINED DRAPERS

Mater Machine Works (Lab Size)  
520 South First Street  
P.O. Box 410  
Corvallis, Oregon 97330

INDENT SEPARATORS (CYLINDER AND DISC)

Carter-Day Company  
655 19th Avenue, N.E.  
Minneapolis, Minnesota 55418

Cleland International, Inc.  
P.O. Box 8  
Rogers, Minnesota 55374



INDENT SEPARATORS (CYLINDER AND DISC)-Continued

Crippen Manufacturing Company  
704 Virginia Street  
Alma, Michigan 48801

Howes, S., Company, Inc.  
1974 Miller Street  
Silver Creek, New York 14136

Equipment Specialists, Inc.  
Route 48, West  
Taylorville, Illinois 62568

Ideal Grain and Cleaning Company  
473 North Cleveland Avenue  
St. Paul, Minnesota 55104

Ferrell-Ross Company  
6501 South Interpace Drive  
P.O. Box 26468  
Oklahoma City, Oklahoma 73126

Mater Machine Works (Special Cylinder)  
520 South First Street  
P.O. Box 410  
Corvallis, Oregon 97330

IRON POWDERS (FOR MAGNETIC SEPARATORS)

Amax Metal Powder  
5948 Packard Road  
Niagara Falls, New York 14304

Gompper-Meschinen-Gesellschaft  
Buederich/Duesseldorf, Germany  
U.S. Representative: Ulbeco, Inc.  
P.O. Box 146  
Bergenfield, New Jersey 07621

Cleveland Metal Abrasive Company  
888-T East 67th Street  
Cleveland, Ohio 44103

Hoeganaes Corporation  
Department TR  
Riverton, New Jersey 08077

LENGTH SEPARATORS (See Indent Separators)MAGNETIC SEPARATORS (See also Iron Powders)

Brummel, H.A., Company  
14347 Laueran Street  
Cedar Lake, Indiana 46303

Gompper-Meschinen-Gesellschaft  
Buederich/Duesseldorf, Germany  
U.S. Representative: Ulbeco, Inc.  
P.O. Box 146  
Bergenfield, New Jersey 07621

Carpco Research & Engineering, Inc.  
4120 Haines Street  
Jacksonville, Florida 32206

Grinder, W.W., Corporation  
2957 North Market  
Wichita, Kansas 67219

Eriez Magnetics  
95 Magnet Drive  
Erie, Pennsylvania 16512

Grisez, John F., Company  
P.O. Box 25  
Crows Landing, California 95313

FMC Corporation  
Syntron Division  
1938 Black Street  
Homer City, Pennsylvania 15748



MAGNETIC SEPARATORS (See also Iron Powders)-Continued

Gunson's Sortex Limited  
Fairfield Road Bow  
London E.3  
England

Separation Engineering Corporation  
110 East 42nd Street  
New York, New York 10017

Magnetics International, Inc.  
Ohio Electric Motor Division  
5398 Dunham Road  
Maple Heights, Ohio 44137

Sortex Company of North America  
P.O. Box 160  
Lowell, Michigan 49331

PACKAGING MACHINERY

Ballard Seed & Packeting Machine Co.  
Harvard  
Massachusetts 01451

Hance Corporation  
235 East Broadway  
Westerville, Ohio 43081

Bemis Company, Inc.  
800-T Northstar Center  
Minneapolis, Minnesota 55402

Howe-Richardson Scale Company  
680 Van Houten Avenue  
Clifton, New Jersey 07015

Burrows Equipment Company  
1316 North Sherman Avenue  
Evanston, Illinois 60201

Howes, S., Company, Inc.  
1974 Miller Street  
Silver Creek, New York 14136

Corn States Metal Fabricators, Inc.  
1323 Maple Street  
West Des Moines, Iowa 50265

Kansteiner, Walter H., Machinery Co.  
2701 West Howard  
Chicago, Illinois 60645

D & G Associates  
6215 West Touhy Avenue  
Chicago, Illinois 60648

Lawrence Packaging Supply Corporation  
113-T North 13th Street  
Newark, New Jersey 07107

Doboy Packaging Machinery  
871 South Knowles Avenue  
New Richmond, Wisconsin 54017

McLaughlin, Ward and Company  
409 South 23rd Street  
Jackson, Michigan 49203

Equipment Specialists, Inc.  
Route 48, West  
Taylorville, Illinois 62568

Parsons Automatic Scale Company  
1331 Eighth Street  
Berkeley, California 94710

Fischbein, Dave, Company  
2722 30th Avenue, South  
Minneapolis, Minnesota 55406

Red Oak Manufacturing Company  
P.O. Box 1117  
Red Oak, Iowa 51566

Hamac-Hansella Machinery Corp.  
15 Seeley Avenue  
Piscataway, New Jersey 08854

St. Regis Paper Company  
150 East 42nd Street  
New York, New York 10017





PACKAGING MACHINERY (Continued)

Seedburo Equipment Company  
618-628 West Jackson Blvd.  
Chicago, Illinois 60606

Stoker, H.L., Company  
111 South College Avenue  
Claremont, California 91711

Stokes Equipment Company, Inc.  
Horsham Valley Industrial Center  
400 Caredean Drive  
Horsham, Pennsylvania 19044

PNEUMATIC SEPARATORS

Burrows Equipment Company  
1316 North Sherman Avenue  
Evanston, Illinois 60201

Carter-Day Company  
655 19th Avenue, N.E.  
Minneapolis, Minnesota 55418

Cleland International, Inc.  
P.O. Box 8  
Rogers, Minnesota 55374

Corn States Metal Fabricators, Inc.  
1323 Maple Street  
West Des Moines, Iowa 50265

Equipment Specialists, Inc.  
Route 48, West  
Taylorville, Illinois 62568

Erickson, E.L., Products (Lab Size)  
513 Main Avenue  
Brookings, South Dakota 57006

Ferrell-Ross Company  
6501 South Interpace Drive  
P.O. Box 26468  
Oklahoma City, Oklahoma 73126

Forsbergs, Inc.  
Corner Conley & Hughes Streets  
Thief River Falls, Minnesota 56701

Howes, S., Company, Inc.  
1974 Miller Street  
Silver Creek, New York 14136

Huntley Manufacturing Company  
Buckholtz Road  
Brocton, New York 14716

Mandrel Products  
6909 Southwest Freeway  
P.O. Box 36306  
Houston, Texas 77036

Mater Machine Works (Lab Size)  
520 South First Street  
P.O. Box 410  
Corvallis, Oregon 97330

Meyer Machine Company  
3530 Fredericksburg Road  
San Antonio, Texas 78201

Scientific Separators, Inc.  
420 Majestic Building  
Denver, Colorado 80202

Seedburo Equipment Company  
618-628 West Jackson Blvd.  
Chicago, Illinois 60606

Sortex Company of North America  
P.O. Box 160  
Lowell, Michigan 49331

Union Iron Works  
600 East William Street  
Decatur, Illinois 62523



RICE ROLLS (See Velvet-Roll Separators)SCALES

Bemis Company, Inc.  
800-T Northstar Center  
Minneapolis, Minnesota 55402

Burrows Equipment Company  
1316 North Sherman Avenue  
Evanston, Illinois 60201

D & G Associates  
6215 West Touhy Avenue  
Chicago, Illinois 60648

Detecto Scales, Inc.  
103-00 Foster Avenue  
Brooklyn, New York 11236

Erickson, E.L., Products  
513 Main Avenue  
Brookings, South Dakota 57006

Howe Richardson Scale Company  
680 Van Houten Avenue  
Clifton, New Jersey 07015

Lawrence Packaging Supply Corp.  
113-T North 13th Street  
Newark, New Jersey 07107

Ohaus Scale Corporation  
35 Hanover Road  
Florham Park, New Jersey 07932

Pack-Rite Machines  
3817 Nicholson Road  
Franksville, Wisconsin 53126

Parsons Automatic Scale Company  
1331 Eighth Street  
Berkeley, California 94710

Red Oak Manufacturing Company  
P.O. Box 117  
Red Oak, Iowa 51566

St. Regis Paper Company  
150 East 42nd Street  
New York, New York 10017

Seedburo Equipment Company  
618-628 West Jackson Blvd.  
Chicago, Illinois 60606

Stoker, H.L., Company  
111 South College Avenue  
Claremont, California 91711

Torison Balance Company  
Colfax and Monhegan Streets  
Clifton, New Jersey 07013

Troemner, Henry, Inc.  
6824 Greenway Avenue  
Philadelphia, Pennsylvania 19142

SCALPERS (See Air-Screen and Screen Machines)SCARIFIERS (HULLERS)

Bauer Bros. Company  
1717 Sheridan Avenue  
Springfield, Ohio 45505

Carter-Day Company  
655 19th Avenue, N.E.  
Minneapolis, Minnesota 55418

Cleland International, Inc.  
P.O. Box 8  
Rogers, Minnesota 55374

Crippen Manufacturing Company  
704 Virginia Street  
Alma, Michigan 48801





SCARIFIERS (HULLERS)-Continued

Engelberg, Inc.  
7 North and Vine Streets  
Liverpool, New York 13088

Howes, S., Company, Inc.  
1974 Miller Street  
Silver Creek, New York 14136

Erickson, E.L., Products  
513 Main Avenue  
Brookings, South Dakota 57006

Rice, W.A., Seed Company  
Jerseyville  
Illinois 62050

Ferrell-Ross Company  
6501 South Interpace Drive  
P.O. Box 26468  
Oklahoma City, Oklahoma 73126

SCREENS

*(Screens are commonly stocked by the manufacturers of air-screen machines. In addition, other screen sizes and shapes are available from the following manufacturers:)*

California Perforated Screen Co.  
655 Bryant Street  
San Francisco, California 94107

Hendrick Manufacturing Company  
33 Dundaff Street  
Carbondale, Pennsylvania 18407

Harrington & King Perforating Co., Inc.  
5653 Fillmore Street  
Chicago, Illinois 60644

Mundt Perforations, Inc.  
550 Hadley Road  
South Plainfield, New Jersey 07080

SIZERS (See Air-Screen and Screen Machines)SPIRAL SEPARATORS

Cleland International, Inc.  
P.O. Box 8  
Rogers, Minnesota 55374

Howes, S., Company, Inc.  
1974 Miller Street  
Silver Creek, New York 14136

Hance Corporation  
235 East Broadway  
Westerville, Ohio 43081

STONERS

Carter-Day Company  
655 19th Avenue, N.E.  
Minneapolis, Minnesota 55418

Forsbergs, Inc.  
Corner Conley & Hughes Streets  
Thief River Falls, Minnesota 56701



STONERS (Continued)

Howes, S., Company, Inc.  
1974 Miller Street  
Silver Creek, New York 14136

Rice, W.A., Seed Company  
Jerseyville  
Illinois 62050

Oliver Manufacturing Company, Inc.  
P.O. Box 512  
Rocky Ford, Colorado 81067

Triple/s Dynamics Sutton/Overstrom, Inc.  
1029 South Haskell  
Dallas, Texas 75223

TREATERS

Agricultural Laboratories, Inc.  
1145 Chesapeake Avenue  
Columbus, Ohio 43212

Equipment Specialists, Inc.  
Route 48, West  
Taylorville, Illinois 62568

Burrows Equipment Company  
1316 North Sherman Avenue  
Evanston, Illinois 60201

Erickson, E.L., Products  
513 Main Avenue  
Brookings, South Dakota 57006

Calkins Manufacturing Company  
Building No. 15  
Spokane Industrial Park  
Spokane, Washington 99215

Forsbergs, Inc.  
Corner Conley & Hughes Streets  
Thief River Falls, Minnesota 56701

Cleland International, Inc.  
P.O. Box 8  
Rogers, Minnesota 55374

Gustafson, Inc.  
6602 Washington Avenue, South  
Hopkins, Minnesota 55343

Corn States Metal Fabricators, Inc.  
1323 Maple Street  
West Des Moines, Iowa 50265

Seedburo Equipment Company  
618-628 West Jackson Blvd.  
Chicago, Illinois 60606

VELVET-ROLL SEPARATORS

Ferrell-Ross Company  
6501 South Interpace Drive  
P.O. Box 26468  
Oklahoma City, Oklahoma 73126

Rice, W.A., Seed Company  
Jerseyville  
Illinois 62050

Mater Machine Works (Lab Size)  
520 South First Street  
P.O. Box 410  
Corvallis, Oregon 97330

VERTICAL ROTARY SCREEN SEPARATORS (See Air-Screen and Screen Machines)



VIBRATOR FEEDERS

Cleveland Vibrator Company  
2827 Clinton Avenue  
Cleveland, Ohio 44113

Eriez Magnetics  
95 Magnet Drive  
Erie, Pennsylvania 16512

FMC Corporation  
Syntron Division  
1938 Black Street  
Homer City, Pennsylvania 15748

Mandrel Products  
6909 Southwest Freeway  
P.O. Box 36306  
Houston, Texas 77036

VIBRATOR SEPARATORS (DIFFERENT THAN GRAVITY SEPARATORS)

Antlers (Lab Size)  
8555 N.W. Skillings Drive  
Corvallis, Oregon 97330

Mater Machine Works  
520 South First Street  
P.O. Box 410  
Corvallis, Oregon 97330

*(Additional Related Equipment)*

MOISTURE TESTERS USING EXHAUST HEAT

Can-Do Products Ltd.  
505 34th Avenue, S.E.  
Calgary, Alberta  
Canada

Tri-State Metal Fabricators, Inc.  
902 North Dyer Street  
P.O. Box 124, Parkwater Station  
Spokane, Washington 99206

Mater Machine Works  
520 South First Street  
P.O. Box 410  
Corvallis, Oregon 97330

PLOT THRESHERS

Bill's Welding  
210 South Grant  
Pullman, Washington 99163

Chain Machine Company  
P.O. Box 462  
Haven, Kansas 67543

Curl Manufacturing Company, Inc.  
1960 Floral Avenue  
Twin Falls, Idaho 83301

Mater Machine Works  
520 South First Street  
P.O. Box 410  
Corvallis, Oregon 97330

Stevens Equipment Company  
110 Division N.E.  
Salem, Oregon 97301





UNITED STATES DEPARTMENT OF AGRICULTURE  
FOREST SERVICE

EQUIPMENT DEVELOPMENT CENTER

FORT MISSOULA

MISSOULA, MONTANA 59801

ADDRESS REPLY TO  
DIRECTOR  
AND REFER TO

7120

April 26, 1974

Universal Dynamics Corporation  
4200 W. Wheeler Avenue  
Alexandria, Virginia 22304

Gentlemen:

We are currently investigating the methods, equipment, and problems associated with processing seed at Forest Tree Nurseries. As part of our effort, we are preparing a comprehensive reference file on commercially available seed processing equipment so that we may better evaluate the state-of-the-art. This would also help in determining possible design improvements or new machinery that would be desirable at these nurseries.

We are interested in both large and small types of commercially available seed processing equipment and would appreciate it if you would send us catalogs, sketches, or other information on any such equipment that you manufacture. Equipment that we are referring to are as follows:

Air Screen Machines

Driers

Buckhorn Separators

Electrostatic Separators

Bumper Mills

Elevators

Color Sorters

Gravity Separators

Conveyors

Huller - Scarifiers

Debearders

Indent Cylinders

Dehumidifiers

Indent Disc Separators





Packaging Machinery

Pneumatic Separators

Polishers

Screens

Spiral Separators

Velvet-Roll Separators

Vibratory Pits

Moisture Testers

Magnetic Separators

Scales

Scalpers

Seed Treaters

Stoners

Vibrator Feeders

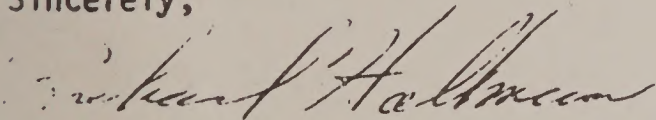
Wagon Lifts

Plot Threshers

Information gathered will be used as reference material and passed along to tree nurseries. This will help them in selection and purchase of the proper equipment required for their seed processing plant.

Thank you.

Sincerely,



R. G. HALLMAN  
Project Leader



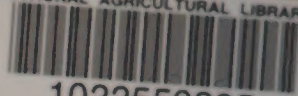


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